

Measuring and forecasting the growth of dates exports in Iraq using the box-Jenkins methodology during the period 1990-2025

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Exporting to any country is an important factor in generating income and providing foreign exchange by increasing those exports. The purpose of the study is to determine the feasibility of production and export of dates to Iraq and to use the Box-Jenkins methodology to predict date exports to Iraq for the years 1990–2025 based on time series. They were represented by the number of dates exported to Iraq in the years 1990-2019. Statistical means and methods were used to study the nature of the time series, where it was noted that there is a clear fluctuation in the quantity of exports. The researchers concluded, through the use of the Box- Jenkins methodology, that the appropriate model for predicting the amount of date exports is the ARIMA model (2,2,1) among a group of models that does not have the best values through the criteria adopted for selection. As well as the model (1,0,0) to predict the production quantities of dates. The study concluded to continue to support the agricultural sector, especially production Dates, because Iraq is characterized by different types, as well as the increase in exports, which is an important part in achieving agricultural economic development, as well as the adoption of economic policies that help encourage exports by supporting producers, which achieves returns on the trade balance and foreign currency.

Keywords: Exports, prediction, production, Box-Jenkins, dates, RIMA model, Time series analysis, Economic development, Production quantities.

INTRODUCTION

The agricultural sector in general is considered to be one of the most important sectors and the production of dates is one of the most important products and Iraq, like the rest of the oil-producing countries, relies on the benchmarks of oil exports to fund its budget and development plans. Development and Operational Expenditure. On the other hand, the world is looking for alternative sources of energy besides oil. Therefore, relying solely on these references has become risky, and everyone is looking for alternative sources of income, for example, relying on the export of manufactured and agricultural products, relying on the fact that Iraq is a major contributor to manufacturing and to the export of dates performs Worldwide, this center must influence its access. The reasonable profits of its exports and its contribution to supporting agriculture in particular and the economy in general, therefore the development of exports of agricultural products, dates in particular, is a goal and a trend that requires development efforts in this important sector, because dates are

one of the most important agricultural products of Iraq because they have played a significant job in financial and social life and the Box-Jenkins models are among the statistical methods that have gained in accuracy and importance over time for serial analysis .

The development of Iraq's agricultural exports, especially the export of agricultural commodities such as dates, has become a priority, and the goal ensures the achievement of, along with others, the continuation of development efforts and the resulting increase in employment opportunities. (Abd,2017), Exports have a large and important role in the economies of both developing and developed countries because of their positive impact on the trade balance. In addition, exports are the only financier of foreign exchange that is spent on all economic sectors. Through exports, the scope of the market is expanded, allowing the economy to increase its production and subsequently exploit the benefits of large-scale production (Mukhlif, 2019).

The focus on date production comes from the fact that they are among the only agricultural products that Iraq continues

to export, even in the most difficult economic conditions it has experienced. Iraq ranked in the top twenty in the world for dates. www.fao.org/faostat. The date product is considered one of the most important mainstays of agricultural activity in the southern regions and oases due to its weight, Economic and social for the region's residents and its contribution to supporting the national economy, so dates can play an essential role, In bringing hard currency to the country through exporting and marketing it. (Babziz, 2017)

MATERIALS AND METHODS

The current research was conducted to measure and forecast the volume of agricultural exports of dates in Iraq

Materials: The importance of studying, Forecasting is of great importance in the economic aspects, as it motivates policy-makers and decision-makers to draw up appropriate policies and The importance of exporting Iraqi dates as it is one of the ways to obtain the hard currency that the state needs, and therefore it is considered a clear national return.

Purpose of the study, Knowing the reality of dates production and exports in Iraq and Identifying the Box-Genghis methodology for predicting the exports of dates in Iraq.

The study Problem, Iraq faces challenges in the economic aspect as it depends mainly on the oil sector, it has now become necessary to diversify in the economic aspect, especially in the agricultural sector, which contributes to food and economic security, and the production of dates is one of the most important crops that played a major role in Iraqi exports and uses However, the growth rate of exports was not as required compared to investment projects.

Study hypothesis, The research is based on the assumption that time series represent magnitudes of dates production in Iraq for the period 1991-2019 is unstable as a result of its fluctuation between rise and fall in that period.

The sample and population size for the study, The study took the time series of dates exports in Iraq for the period 1990-2019.

First: The reality of dates (production, exports) in Iraq for the period 1990-2019

1- Production: Iraq's average production of dates reached about (650,906) tons during the studied period, and the highest production of dates was recorded in 2000 as it reached (932000) tons, while the minimum amounted to about (404030) tons recorded in 2005 as shown in Table 1 and it is clear from that. There are factors that affected the production of dates in Iraq, including military operations and leaving the agricultural sector, as well as the lack of support to help farmers maintain production.

The palm cultivation sector in Iraq has faced a number of obstacles, including neglect and lack of care for palm trees in terms of conducting various service operations, lack of trained manpower in the field of palm service, high costs of service

operations, ignoring price policies and low financial returns from palms, which are not commensurate with the effort Expenditure in service operations, as well as a decrease in the continuous control of widespread pests that cause weak tree growth and low productivity or death of many of them, as well as a sharp decline in palm numbers as a result of military operations in areas where palm orchards abound in the governorates of southern Iraq, and the high salinity rate To high levels of water and its impact on date palm production, as many palm orchards in Iraq have outdated the economic life of production (Alhashimi, 2022).

Table 1. The quantity of Iraq's production of dates for the period (1990-2021).

production quantity (ton)	Years	production quantity (ton)	Years	production quantity (ton)	Years
655450	2012	907000	2001	544930	1990
676111	2013	866000	2002	566220	1991
662447	2014	868000	2003	447840	1992
602348	2015	448380	2004	612580	1993
615211	2016	404030	2005	675820	1994
618818	2017	432360	2006	881020	1995
646163	2018	430861	2007	797450	1996
639315	2019	476318	2008	750000	1997
735353	2020	507002	2009	913000	1998
750225	2021	567668	2010	764000	1999
2.106.6709.00	sum	619182	2011	932000	2000

References: Ministry of Planning / Central Iraq and Commodity and Food Balance Reports - Study years

2- Exports: The average Iraqi exports of dates amounted to (128438.97) tons during the studied period, and recorded the highest exports of dates in 2019 as it amounted to (687510) tons, while the minimum amounted to about (4000) tons recorded in 2001 as shown in Table 2 and this It shows the fluctuations in Iraq's exports of dates as a result of the military wars, the economic blockade and the deterioration of the agricultural sector during the period from 1990-2003, then there was support, but not at the level required by the amount of exports for the year 2019.

Exports have a large and important role in the country's economies and have a positive impact on the trade balance and then the balance of payments. In addition, exports are the only financier of foreign exchange that is spent on all economic sectors. Through exports, the scope of the market is expanded, allowing the economy to increase its production and what follows from it Exploiting the benefits of large-scale production and thus reflecting the extent of the development of the country's capabilities in the level of local production and diversifying it, as the increase in agricultural exports to Iraq, especially its most important export commodities, dates, is an important issue, as it is the agricultural product or the most important references if not the only one that Iraq continued to export even in the most difficult Its economic conditions (Mikhilif, 2019) .Iraq has occupied advanced positions among the most important countries exporting dates



in previous years, because Iraq has a comparative and natural advantage in the production of dates and possesses many important varieties. Some of these varieties are characterized by their commercial importance due to the intensity of their annual production. Including an important return of income that can be added to the national income (Abd, 2017).

Table 2. The quantity of Iraq's exports of dates for the period (1990-2019).

Years	Export Quantity (ton)	Years	Export Quantity (ton)	Years	Export Quantity (tons)
1990	190000	2000	30000	2010	126731
1991	20000	2001	4000	2011	138437
1992	22000	2002	8000	2012	177498
1993	10000	2003	5016	2013	144607
1994	30000	2004	23485	2014	135214
1995	40000	2005	149660	2015	146601.5
1996	50000	2006	42776	2016	216498.6
1997	90000	2007	221016	2017	253360
1998	100000	2008	296642	2018	265340
1999	30000	2009	198777	2019	687510

References: Ministry of Planning / Central Iraq and Commodity and Food Balance Reports - Study years.

The annual growth rate of dates production in Iraq for the period (1990-2019): To show the annual growth rates of the total production of dates in Iraq, the strategy for least squares (OLS) was used and for the purpose of showing the most accurate annual growth rates for the periods shown above, and because the time series data are extreme and interspersed with more than one time period that differ in its events and which have repercussions on the production of dates. Dividing it into four time periods and extracting its annual growth rates (Al-Hayali, 2013) as displayed in the accompanying table

Table 3. The annual growth rates for the period (1990 - 2021) and at different periods.

Annual average rate of increase for the period (2019-2010)	Annual average rate of increase for the period (2010-2000)	Annual average rate of increase for the period (2000-1990)	Annual average rate of increase for the period (2021-1990)
0.0003	-0.005	0.004	-0.003

It is clear from the above table that the annual growth rate for the entire period (1990-2020) was negative and estimated at (-0.003), while the growth rate of the second period was positive due to the country's dependence on the agriculture industry as a result of the economic embargo, if the growth rate for the third period was negative, and this is attributed to the effects of the wars in that period.

Despite that, the fourth period was positive, which indicates the presence of support for the improvement and production of dates in Iraq within the support of the agricultural sector, but the total annual growth rate for that period was low and not as it was previously produced, and the following figure shows the time series to produce dates with the general trend.

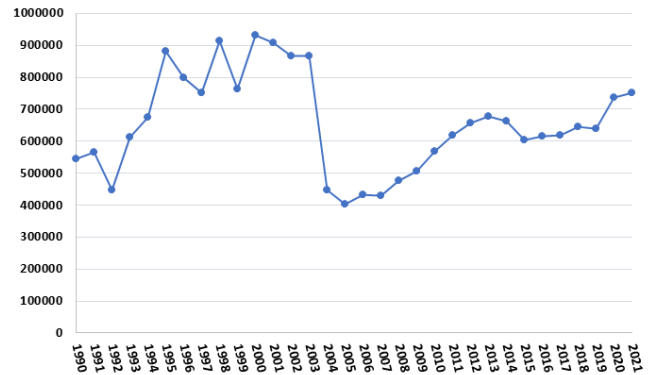


Figure 1. Time series of dates production and annual development rate for the period 1990-2019 in Iraq.

References: Ready by the analyst in light of the information of Table 1.

Box Jenkins Methodology: A time series is defined as a group of observations in mostly equal time periods for a phenomenon and for a period of time, which arises from its relationship to time according to the law of probability (Al-Sarraf, 2013).

Box & Jenkins was intrigued gathering a portion of the time series techniques used to assist with distinguishing the level of the model and gauge its qualities, and afterward offered multiple ways of checking the model's legitimacy to accept at least for now that its last structure (Sheikh, 2011).

Unsound time series can be joined as Arima (p, d, q) and here it is important to look through how to pick the three qualities p, d, q, that is to say, to decide the state of this sort of model, we test the straightforward and fractional autocorrelation elements of the series, which should decide the level of combination d in it to get the steady series, where the autocorrelation p(k) in this series should step by step move toward zero as the quantity of decelerations k increments (Sheikh, 2011).

Where this methodology combines two models in one equation. The first model is an autoregressive AR model, which expresses the variable (Shady, 2015)

$$Y_t = \phi_1 y_{t-1} + \phi_2 y_{t-2} + \dots + \phi_p y_{t-p} + \delta + \varepsilon_t + \theta_1 \varepsilon_{t-1} + \theta_2 \varepsilon_{t-2} + \dots + \theta_q \varepsilon_{t-q}$$

Also, the necessary condition for the stability of the Arima series (p, d, q) is:

$$\sum_{i=1}^p \phi_i < 1$$

Stability here means according to a factual perspective that the arithmetic mean and variance are constant, and the autocorrelation function is used to detect the stability or instability and to put the time series to the test significance of the autocorrelation coefficients as a whole, Price & Box statistics are used (Al-Mawla, 2020).



The stages of Box Jenkins' methodology are: Definition stage: This stage begins with making sure that the time series of the conditions that must be satisfied in the station are still by performing the graph of the ACF and the fractional autocorrelation capability PACF using the sequence graph. from time

Diagnostic stage: The validity and efficiency of the model must be confirmed before using it in future predictions by using the autocorrelation coefficients for the residuals.

Estimation stage: - Any deciding the boundaries of the relapse area and the moving typical segment together or alone.

Forecasting stage: The target of gauging is to involve the current and assessed model in a given time span, to Assessing future qualities as a period series as per the littlest conceivable blunder is finished subsequent to assessing the boundaries of the ARIMA model (p, d, q), which has surpassed the different phases of past tests.

Forecasting is utilized to gauge future qualities as a period series for the littlest conceivable mistake. The assessing model is utilized by ARIMA to anticipate the assessed esteem. It initially computes a worth to foresee one period later on, then, at that point, we utilize this incentive for two periods later on, and we go on similarly until we arrive at the expectation of the particular time frame from now on and there various strategies to figure out the productivity of gauging, including.

Forecasting using Box- Jenkins methodology for dates exports in Iraq: The data shown in Table (2) related to the time series of dates production in Iraq for the period 1990-2019, amounting to 30 observations, were used. The data were analyzed using the statistical program eviews 10. For forecasting, we apply the special stages of the Box Jenkins and Agencies methodology:

Stability: First of all, we will identify the degree of inactivity of the original time series by following the steps that were mentioned previously. Which requires, that the time series be stable.

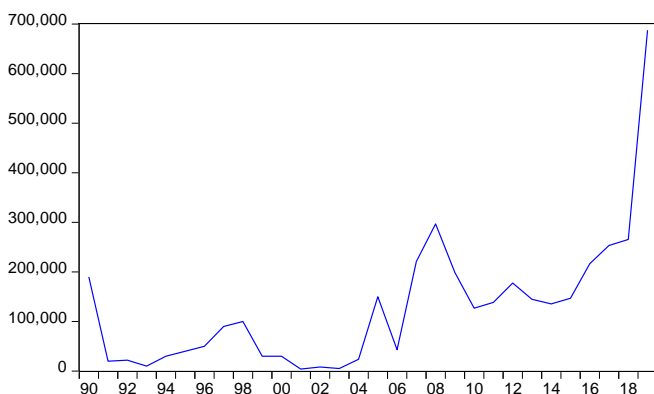


Figure 2. The temporal sequence of dates exports in Iraq for the period 1990-2019.

References: constructed by the investigator using data from Table 1.

Through the data on the exports of dates in Iraq without any modifications to the series, the function was drawn, as we note that the time series takes the form of a general trend and is unstable, and the reason may be due to the fluctuation in the quantity of date exports as a result of the conditions that Iraq passed through, so it requires taking the first distinctions The original time series, as well as in order for the series to become stable, there are several procedures that were followed, such as taking the natural logarithm and the differences (1 and 2), and it was found that they did not give stability to the time series except for the first differences of the logarithmic series as stated in the ADF test, where the results of the analysis indicated the soundness of the logarithmic series at the level Significance 0.01 with a value of 6.738 –

	t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.738	0.000
Test critical 1% level	-3.689	
values: 5% level	-2.972	
10% level	-2.625	

For the purpose of proving or ensuring the stability of the time series, we will draw the autocorrelation (ACF) and partial autocorrelation (PACF) functions as in the figure below:

Date: 04/30/22 Time: 15:12

Sample: 1990 2025

Included observations: 29

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1		-0.049	-0.049	0.0776	0.781
2		-0.008	-0.011	0.0800	0.961
3		0.099	0.098	0.4189	0.936
4		0.004	0.014	0.4194	0.981
5		-0.048	-0.046	0.5042	0.992
6		-0.176	-0.193	1.7154	0.944
7		0.055	0.036	1.8410	0.968
8		0.029	0.046	1.8765	0.985
9		-0.096	-0.055	2.2892	0.986
10		-0.088	-0.114	2.6593	0.988
11		0.132	0.103	3.5354	0.982
12		0.228	0.251	6.2853	0.901

Figure 3. shows the partial and autocorrelation function of dates exports in Iraq.

Determine and estimate the ARIMA (p,d,q) model: We notice from Figure 2 that the functions of autocorrelation and partially autocorrelation of the series lie between the confidence limits and there are no external columns after the first difference, i.e. the degree of integration $d = 1$, and then we work to determine the appropriate ARIMA (p, d, q) model by filtering a set of ARIMA models The comparison between it and the BIC and AIC standards, after that the ARIMA model is determined, and Table 3 illustrates the determination of the best ARIMA model is the model (2,2,1) not the lowest



values for the AIC standards and according to the results of Table 4

Table 4. Results of determining the best model for a group of ARIMA models.

ARIMA	(0,1,1)	(0,1,2)	(1,1,1)	(1,1,2)	(2,1,1)	(2,1,2)
Sig	0.07	0.00	00	0.00	0.00	0.00
SIGMASQ	0.00	0.00	0.00	0.82	0.08	0.00
Adj.R ²	0.30	0.33	0.30	0.48	0.54	0.49
AIC	3.12	3.11	3.13	2.86	2.76	2.85

The researcher prepared the references: The results of determining the ARIMA model indicated that the (2, 1, 1) model was the greatest model because of the significance of 0.00, and the coefficient of determination was 0.49, while the two AIC criteria came with the lowest value of 2.85, and in the end, SIGMASQ was significant, which is 0.00, which means that it is possible to predict this model and obtain good results.

Table 5. Shows the outcomes of estimating the ARIMA (2,1,2) model, where we note that the constant parameter and the autoregression are all significant.

Dependent Variable: LEX
Method: ARMA Maximum Likelihood (OPG - BHHH)
Date: 04/29/22 Time: 14:06
Sample: 1990 2019
Observations that included: 30

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	11.41640	0.841281	13.57025	0.0000
AR(2)	0.600372	0.190863	3.145563	0.0041
MA(1)	0.665663	0.201057	3.310812	0.0027
SIGMASQ	0.760216	0.193974	3.919172	0.0006
The R ²	0.543098	Mean dependent var	11.134	
Adjusted R ²	0.490378	S.D. dependent var	1.3120	
S.E. of regression	0.936575	Akaike info criterion	2.8591	
Sum squared resid	22.80648	Schwarz criterion	3.0459	
Log likelihood	-38.88626	Hannan-Quinn criter.	2.9189	
F-statistic	10.30165	Durbin-Watson stat	1.8311	
Prob(F-statistic)	0.000120			

Diagnosing the model: After completing the model estimation, we move on to diagnosing the model, which is summarized by examining the residuals of the model (2,1,2) ARIMA, where we notice from the figure below that the actual values are close to the real values and at a very close distance, which means the efficiency of the model (Gujarati,2004)

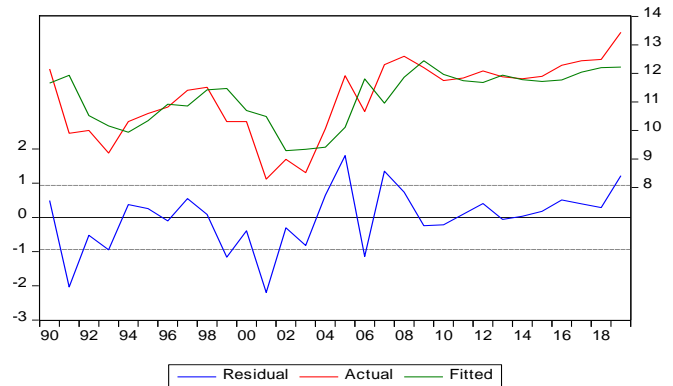


Figure 4. Autocorrelation and partial correlation values for the residuals

Source: Software output based on Eviews-10.

Then the values of the autocorrelation and halfway relationship of the residuals are examined, as it is clear from the figure below that the autocorrelation coefficients and partial autocorrelation values coefficients are within the confidence interval and this means the independence of the residuals from each other. (Box,1976).

Date: 04/29/22 Time: 15:30

Sample: 1990 2019

Included observations: 30

Q-statistic probabilities adjusted for 2 ARMA terms

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1		0.044	0.044	0.0645	
2		0.193	0.191	1.3390	
3		0.053	0.039	1.4385	0.230
4	-0.226	-0.277	3.3217	0.190	
5	-0.024	-0.028	3.3430	0.342	
6	-0.281	-0.196	6.5031	0.165	
7	0.067	0.139	6.6923	0.245	
8	0.198	0.278	8.3968	0.210	
9	0.027	-0.008	8.4292	0.296	
10	0.312	0.114	13.096	0.109	
11	0.050	0.020	13.225	0.153	
12	0.055	-0.015	13.387	0.203	
13	-0.114	-0.125	14.118	0.227	
14	-0.091	0.102	14.619	0.263	
15	0.046	0.114	14.757	0.323	
16	-0.264	-0.247	19.538	0.145	

Figure 5. shows the partial and autocorrelation function of dates exports in Iraq

Forecasting: After diagnosing the model and making sure that it is statistically acceptable, then we work to adopt it in forecasting exports of dates in Iraq for the period 1990-2019, as we note from the table and figure Iraq's forecast exports for each of the years for the period 2023-2025.

Predicted quantity	Year
907593.2	2023
907754.1	2024
907749.6	2025



It is clear from the above table that the predicted quantities are increasing, but these increases are not in quantities, the ambitious level to be reached, since there is support for the agricultural sector, and there may be projects under construction that will add a return on production, but require a certain time period for production, and this is shown in the following figure: -

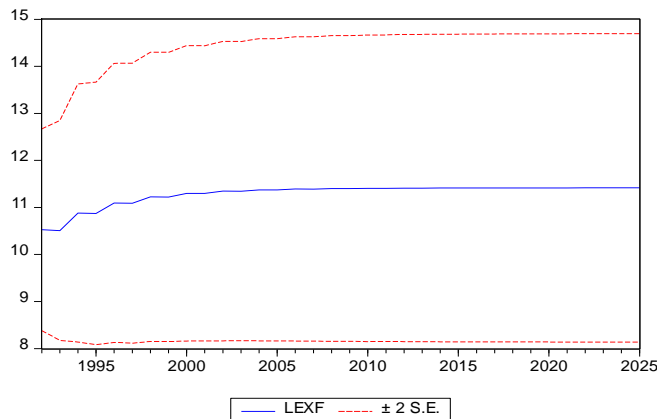


Figure 6. The predicted quantities are increasing of dates exports in Iraq.

Predicting the use of the Box-Jenkins methodology for producing dates in Iraq: The information displayed in Table (1) related to the time series of dates production in Iraq for the period 1990-2021, amounting to 30 observations, were used. The data were analyzed using the statistical program reviews 10. For forecasting, we apply the special stages of the Box Jenkins and Agencies methodology:

Stability: First of all, we will identify the degree of inactivity of the original time series by following the steps that were mentioned previously. Which requires, that the time series be stable.

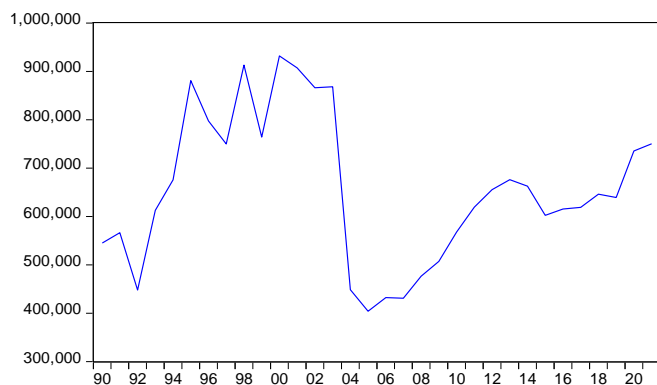


Figure 7. The time series" of dates production in Iraq for the period 1990-2021.

References: Based on the data in Table 2, this analysis was created by the researcher.

Through the data on the production of dates in Iraq without any modifications to the series, the function was drawn, as we note that the time series takes the form of a general trend and is unstable, and the reason may be due to the fluctuation in the quantity of date exports as a result of the conditions that Iraq passed through, so it requires taking the first distinctions of the series. The original time series, and in order for the series to become stable, there are several procedures that were followed, such as taking the natural logarithm and the differences (1 and 2), and it was found that they did not give stability to the time series except for the first differences of the logarithmic series as stated in the ADF test, where the results of the analysis indicated the consistency of the of the logarithmic series at the significance level 0.01 with a value of 6.001 –

	t-statistic	Prob.*
Augmented Dickey-Fuller test statistic	-6.001	0.000
Test 1% level	-3.670	
critical 5% level	-2.963	
values: 10% level	-2.621	

For the purpose of proving or ensuring the stability of the time series, we will draw the autocorrelation (ACF) and fractional autocorrelation (PACF) capabilities as in the illustration beneath:

Date: 04/13/23 Time: 02:02

Sample: 1990 2021

Included observations: 31

Autocorrelation	Partial Correlation	AC	PAC	Q-Stat	Prob
1		-0.125	-0.125	0.5336	0.465
2		0.121	0.107	1.0514	0.591
3		0.034	0.063	1.0947	0.778
4		-0.323	-0.335	5.0540	0.282
5		0.250	0.196	7.5106	0.185
6		-0.326	-0.250	11.846	0.065
7		0.061	0.003	12.004	0.100
8		0.020	-0.029	12.022	0.150
9		-0.244	-0.145	14.799	0.097
10		-0.013	-0.297	14.807	0.139
11		-0.096	0.088	15.279	0.170
12		0.129	0.066	16.171	0.184
13		0.036	-0.086	16.245	0.236
14		-0.027	-0.078	16.290	0.296
15		0.026	-0.035	16.333	0.360
16		-0.063	-0.124	16.604	0.412

Determine and estimate the ARIMA (p,d,q) model: We notice from Figure 2 that the functions for autocorrelation and partial autocorrelation of the series lie between the confidence limits and there are no external columns after the first difference, i.e. the degree of integration $d = 1$, and then we work to determine the appropriate ARIMA (p, d, q) model by filtering a set of ARIMA models. The comparison between it and the BIC and AIC standards, after that the ARIMA model is determined, and Table 3 demonstrates the determination of the best ARIMA model is the model (1,0,0) not the lowest



values for the AIC standards and according to the results of Table 5 (Ahmed, 2012)

Table 5. Results of determining the best model for a group of ARIMA models.

ARIMA	(1,0,0)	(1,6,1)	(1,1,1)	(1,1,2)	(2,2,1)	(2,1,2)
Sig	0.00	0.83	0.00	0.64	0.10	0.59
SIGMASQ	0.00	0.00	0.99	0.00	0.99	0.00
Adj.R ²	0.53	0.05	0.03	0.02	0.16	0.04
AIC	-0.65	26.15	26.20	26.26	26.12	26.23

The researcher prepared the references: The results of determining the ARIMA model indicated that the (1, 0, 0) model was the best model because of the significance of 0.00, and the coefficient of determination was 0.53, while the two AIC criteria came with the lowest value of -0.65, and in the end, SIGMASQ was significant, which is 0.00, which means that it is possible to predict this model and obtain good results.

Table 6. The results of estimating the ARIMA (1,0,0) model, where we note that the constant parameter and the autoregression are all significant.

Dependent Variable: LOG(X)
 Method: ARMA Maximum Likelihood (BFGS)
 Date: 04/13/23 Time: 15:08
 Sample: 1990 2021
 Included observations: 32
 Convergence achieved after 4 iterations
 Coefficient covariance computed using outer product of gradients

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.36730	0.121513	110.0073	0.0000
AR(1)	0.741154	0.145883	5.080458	0.0000
SIGMASQ	0.024567	0.005003	4.910385	0.0000

R-squared	0.566835	Mean dependent var	13.36712
Adjusted R-squared	0.536962	S.D. dependent var	0.241958
S.E. of regression	0.164645	Akaike info criterion	-0.656084
Sum squared resid	0.786132	Schwarz criterion	-0.518671
Log likelihood	13.49734	Hannan-Quinn criter.	-0.610536
F-statistic	18.97457	Durbin-Watson stat	1.833260
Prob(F-statistic)	0.000005		

Inverted AR Roots	.74
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Diagnosing the model: After completing the model estimation, we move on to diagnosing the model, which is summarized by examining the residuals of the model (1,0,0) ARIMA, where we notice from the figure below that the actual values are close to the real values and at a very close distance, which means the efficiency of the model (Gujarati, 2004)



Figure 8. Autocorrelation and partial correlation values for the residuals.

Source: Software output based on Eviews-10

Then the values of the autocorrelation and the circumscribed correlation residuals are examined, as it is clear from the figure below values of the autocorrelation coefficients and the partial autocorrelation coefficients are within the confidence interval and this means the independence of the residuals from each other. (BOX, 1976)

Forecasting: After diagnosing the model and making sure that it is statistically acceptable, then we work to adopt it in forecasting production of dates in Iraq for the period 1990-2021, as we note from the table and figure Iraq's forecast production for each of the years for the period 2023-2025.

Predicted quantity	Year
917410.53	2023
920470.50	2024
920015.15	2025

It is clear from the above table that the predicted quantities are increasing, but these increases are not in quantities, the ambitious level to be reached, since there is support for the agricultural sector, and there may be projects under construction that will add a return on production, but require a certain time period for production, and this is shown in the following figure: -

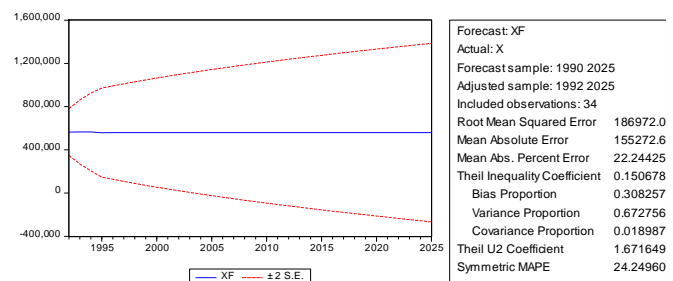


Figure 9. The predicted quantities are increasing of dates exports in Iraq.



Conclusions: The fluctuation of production quantities of dates by charting the time series and the extent to which they are affected by the conditions that the country has gone through such as military operations, economic blockade and others.

1. The ARIMA (2,1,2) model, through the diagnostic tests of the model, residual graph, autocorrelation capability and fractional autocorrelation capability, we note that the predicted quantity for the period 1990-2025 indicates an increase, but this increase may not be at the required level.
2. The ARIMA (1,0,0) model, through the diagnostic tests of the model, residual graph, autocorrelation capability and fractional autocorrelation capability, we note that the predicted quantity for the period 1990-2025 indicates an increase, but this increases a little bit.

Recommendations: Considering the discoveries of the study, some recommendations can be suggested as follows: -

- 1- Continuing to support the agricultural sector, especially the production of dates, as Iraq is characterized by different types, as well as increasing exports, which is an important part in achieving agricultural economic development.
- 2- Introducing fast-growing and advanced types to reduce the time period of production to keep pace with and increase production to cover domestic consumption and exports.
- 3- Adopting economic policies that help encourage exports by supporting producers, which will achieve returns on the trade balance and foreign currency.

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REFERENCES

- Abd, Y. Samir. 2017. Applying the gravity model to the external trend in Iraq (dates, leather and wool as a model) for the period (1990-2014), Master's thesis, College of Agriculture, University of Baghdad, Agricultural Economics.
- Abd, E. S. & AL-Badri, B. H. 2017. An application of the gravity model on foreign trade in Iraq (the wool case study) during (1990-2014). *Iraq journal of agricultural research* 48: doi: 10.36103/ijas.v48i4.360.
- Ahmed, A. F., & M. A. Ibrahim, 2012. Forecasting Production and Consumption of Bread Wheat In Iraq For The Period 2007-2016 Using Arima Model. *Iraqi Journal of Agricultural Sciences* 43:113-129
- Alhashimi, A. N. Mohammad. 2022. An economic analysis to measure the effect of government intervention policy in Iraqi dates on the comparative and competitive advantage for the period (1990-2021), an unpublished master's thesis, College of Agriculture, University of Baghdad, Agricultural Economics.
- Al-Hayali, A. D. Kassar. 2013. *Agricultural Statistics Book*, University of Baghdad, College of Agriculture, Department of Agricultural Economics.
- Al-Mawla, A. S. R. Hassan. 2020. Predicting the production of wheat in Iraq using the Box-Genghis model, *Anbar Journal of Agricultural Sciences* 8:109-118
- Al-Sarraf, N. Mustaf and S. A. Hassan. 2013. Time Series and Indices, *Dar Al-Doctor for Administrative and Economic Sciences...* Vol:...??
- Box, G.P. and G.M. Jenkins. 1976. *Time Series Analysis Forecasting and Control*, Revised Edition Holden-Day Inc. San Francisco
- Gujarati, D. N., and D.C. Porter. 2004. *Basic econometrics* (ed.) McGraw-Hill. Irwin, a business
- Mukhlif, T. Zaidan and M. I. Muzahim,. 2019. Economic and Analytical Analysis of Iraq's Foreign Exports of Dates for Mudara 1995-2017, *Tikrit Journal of Administrative and Economic Sciences* 15:47.
- Shady, I. Y. El-Telbani. 2015. Using the Box Jenkins methodology to predict wheat production, a case study of China, *Al-Azhar University Journal*, Gaza 17:147-160
- Sheikh M. 2011. *Methods of econometrics, lectures and applications*, first edition, Dar Al-Hamid, pp. 23.
- Babziz, A. Badr. 2017. El-Din. The impact of the export of dates on the development of palm cultivation in Algeria (2015-2016) Doctoral dissertation, University of Kasdi Merbah Ouargla).

